REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

In the specification, the paragraph starting at Page 10, Line 9 has been amended. Support for the amendments can be found in Figures 3-5. No new matter is added.

Figures 1 and 14 have been amended. Figure 1 is amended to include a legend of "Related Art" to overcome the drawing objections. Figure 14 is amended to correct typographical errors. Support for the amendments can be found in the paragraph starting from Page 12, Line 25. No new matter is added.

Claims 1 and 3-5 are currently being amended. Claims 15-16 are being added.

This amendment adds, changes and/or deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

After amending the claims as set forth above, claims 1-16 are now pending in this application.

Drawings

Figure 1 is objected. Applicants respectfully submit that the Figure 1 shows an experimental result newly found out by the inventors, which is not publicly known in the art at the time of the invention. Accordingly, Figure 1 is amended to include a legend of "Related Art."

Figure 14 is objected, for not including reference signs 7a and 7c mentioned in the Specification. Figure 14 is amended to correct the typographical errors. Support for the amendments can be found in the paragraph starting from Page 12, Line 25. No new matter is added.

Figures 3-5 are objected for including reference signs #33, #36 and #39 that are not mentioned in the description. The Specification is amended to recite "as compared with curved lines 31, 34, and 37 representing Fe, Ni, and Cu before the cleaning, Fe, Ni, and Cu are reduced, as shown by arrows 33, 36, and 39 in Figs. 3 to 5, even at the curve center portion where the segregation amounts are large."

By way of this Reply, the drawing objections are now moot.

Claim Objections

Claim 3 is objected to. Claim 3 is amended to correct the typographical errors. No new matter is added.

By way of this Reply, the claim objection is now moot.

Claim Rejections under 35 U. S. C. §§ 102 and 103

Claims 1-11 and 14 are rejected under 35 U.S.C. 102 (b) as being anticipated by Otsuki (U.S. 2002/0005213). Applicants respectfully traverse for at least the reasons that follow. Claim 12 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Otsuki, and as being unpatentable over Otsuki in view of Morgan (U.S. 2004/0029392). Claim 13 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Otsuki in view of Ohmi (U.S. 6,348,157), and as being unpatentable over Otsuki in view of Morgan and Ohmi.

Independent claim 1 is amended to recite "A silicon carbide product comprising single-crystalline or polycrystalline silicon carbide, wherein the single-crystalline or polycrystalline silicon carbide is cleaned only by an acidic solution, the single-crystalline or polycrystalline silicon carbide having a surface with a concentration of metal impurities equal to or less than 1×10^{11} atoms/cm^2." Independent claims 4 and 5 are amended to recite cleaning the single-crystalline or polycrystalline silicon carbide by using only an acidic solution to reduce surface metal impurities to $1x10^{11}$ atoms/cm^2 or less. Support for amendments can be found throughout the Specification, for example in the paragraphs starting from Page 11, Line

1 and Page 13, Line 8. Further, in non-limiting examples disclosed in the Specification, the concentration of metal impurities of a single-crystalline or polycrystalline silicon carbide product manufactured by a CVD method can be reduced to be equal to or less than 1×10^{11} atoms/cm^2 by using only one acid cleaning step using a cleaning solution (SPM) containing sulfuric acid (97%) and a hydrogen peroxide solution (30%). No new matter is added.

A. Otsuki fails to teach all elements recited in independent claims 1 and 5

Otsuki teaches a sintered silicon carbide that is manufacture by heating a mixture of the silicon carbide powder and a nonmetallic auxiliary sintering agent (Otsuki, Paragraph [0046]). Otsuki further teaches that a substance which generates carbon in the presence of heat (e.g., organic compounds or carbon black and graphite) is used as the nonmetallic auxiliary sintering agent (Otsuki, Paragraph [0047]-[0049]).

Applicants respectfully submit that inherently such a sintered silicon carbide is completely different in both physical and chemical characteristics from single-crystalline or polycrystalline silicon carbide, as recited in claims 1, 4 and 5. Indeed, Otsuki explicitly teaches that the sintered silicon carbide has a density greater than 2.9 g/cm^3 (Otsuki, Paragraph [0013]) and equal to 3.13 g/cm^3 (Otsuki, Paragraph [0118]) and is porous (Otsuki, Paragraph [0073]).

Thus, Otsuki fails to teach a single-crystalline or polycrystalline silicon carbide having a surface with a concentration of metal impurities equal to or less than 1×10^{11} atoms/cm^2, as recited in independent claims 1, 4 and 5.

B. Morgan and Ohmi fail to cure the deficiencies of Otsuki

First, Applicants respectfully submit that there is no motivation to combine Morgan and Ohmi with Otsuki as the Office Action suggests. Specifically, both Morgan and Ohmi are related to a method of processing silicon, a material having completely different physical and chemical properties from sintered silicon carbide of Otsuski. Thus, one of ordinary skill in the art would not readily apply the cleaning process of silicon to silicon carbide, and vice versa. For example, if the cleaning process of Comparative Example 2 taught in Otsuki et al.

(Otsuki, paragraph [0140]) is applied to silicon, the silicon material of Morgan and Ohmi would have been etched instead of being cleaned.

Further, as explained above, Morgan and Ohmi are related to silicon, rather than silicon carbide, thus also fail to teach a single-crystalline or polycrystalline silicon carbide having a surface with a concentration of metal impurities equal to or less than 1×10^{11} atoms/cm^2, as recited in independent claims 1, 4 and 5.

C. Claimed features provide unexpected results

Furthermore, as well known in the art, one of ordinary skill of art would expect that multiple cleaning steps are required to clean the silicon carbide surface. Consistently, Otsuki teaches to firstly dip the sintered silicon carbide into a quasi-aqueous organic solvent (a mixed solvent containing a petroleum hydrocarbon, an ester of an organic acid and a nonionic surfactant) while ultrasonic vibration is applied, rinsed with water, dipped into an aqueous mixture of hydrofluoric acid and nitric acid and then dipped into pure water to obtain a sintered silicon carbide of Example 1 (Otsuki, Paragraph [0120]). In other words, in order to obtain a sintered silicon carbide with the surface cleanliness of 8×10^{9} to 1×10^{11} atoms/cm^2, by multiple cleaning processes in addition to an acid cleaning step is required. In fact, when only the acid cleaning step is carried out and the quasi-aqueous organic solvent cleaning is omitted, the surface cleanliness is greater than 1×10^{11} atoms/cm^2 as shown in Comparative Example 2 (Otsuki, Table 1 and Paragraphs [0140]-[0142]), in contrast to claims 1, 4 and 5.

Thus, it is indeed surprising that a step of acid treatment is sufficient to clean a single-crystalline or polycrystalline silicon carbide to obtain a surface with a concentration of metal impurities equal to or less than 1×10^{11} atoms/cm^2, as recited in claims 1, 4 and 5.

Claims 2- 3 depend from claim 1, and thus are patentable for at least the same reasons as claim 2. Claims 6- 14 depend from claim 5, and thus are patentable for at least the same reasons as claim 5.

New Claims

Newly added claim 15 depends from claim 5, and further recites "growing a polycrystalline silicon carbide layer over a whole of a graphite base member by a CVD method and separating the polycrystalline silicon carbide layer from the graphite base member by burning out the graphite base member." Thus, claim 15 is patentable for at least the same reasons as claim 5. In addition, Applicants respectfully submit that none of Otsuki, Morgan and Ohmi disclose the above recited features of claim 15.

Newly added claim 16 depends from claim 5, and further recites "providing a base member; and growing the single-crystalline or polycrystalline silicon carbide over the base member." Thus, claim 16 is patentable for at least the same reasons as claim 5. In addition, Applicants respectfully submit that none of Otsuki, Morgan and Ohmi disclose the above recited features of claim 16.

Conclusion

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing or a credit card payment form being unsigned, providing incorrect information resulting in a rejected credit card transaction, or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith,

Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorize payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date 7/20/2004 By

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